C.D. Howe Institute
Institut C.D. Howe

Celebrating/Nous célébrons 50 years/ans

e-brief

July 14, 2010

MONETARY POLICY

Greater Transparency Needed

By

Angelo Melino and Michael Parkin

- Financial market participants would benefit from a better understanding of how the Bank of Canada sets the overnight interest rate in response to economic developments. More accurate forecasts of the Bank's future policy choices would lead to better financial decisions and better price and wage-setting decisions, making it easier for the Bank to hit its 2 percent inflation target.
- Currently, the Bank's internal model predicts a path for the overnight rate that is inconsistent with the expectations of the Bank's Governing Council.
- The Bank could achieve greater transparency by publishing its own conditional forecasts of the future path of the overnight rate or, failing that, by publishing such forecasts with a six-month lag. This would enable market participants to better understand what these forecasts mean and how to use them in economic decision-making.

How fast and how far will the Bank of Canada go in raising the overnight rate? No one, not even the members of the Bank's Governing Council,[1] can answer this question. But the Bank can respond to economic developments in a predictable fashion so businesses and households are better able to forecast its future actions. And the most effective way of achieving the transparency needed is to use a simple robust rule for setting the policy interest rate (Cateau and Murchison, 2010). More accurate forecasts of the Bank's future policy choices lead to better financial decisions, better price and wage-setting decisions, and the attainment of low and stable inflation with minimum disturbance to the real economy.

Cateau and Murchison take an important next step toward greater transparency by drawing attention to the endogenous overnight rate policy rule used in the Bank's quarterly projection model, ToTEM, to forecast the public's beliefs about the future path of the overnight rate (Murchison and Andrew 2006; Box 1). This rule gives us a forecasting equation calibrated to mimic what the Bank would do in each future period as events unfold. It should be possible to combine this rule with the Bank's forecasts of inflation and the output gap to recover a useful approximation to the Bank's belief about the overnight rate path that is conducive to the Bank's hitting its central policy target, a 2 percent inflation rate.

The Bank has published its policy rule before, in 2006. But that was in the Technical Report that describes the structure of ToTEM. In the context of this earlier paper, the rule appeared as little more than a convenient way of closing the model so that it could forecast beyond the current rate-setting period. Further, because ToTEM was at that time a new model, it was not clear what role the model, still less an individual equation, might play in the policy evaluation and rate-setting process.

We wish to thank Angela Redish, Avery Shenfeld, Pierre Siklos and anonymous reviewers for their comments on an earlier version.

1 The Governing Council is the policy-making body of the Bank. It consists of the Governor, Senior Deputy Governor, and four Deputy Governors. It is responsible for monetary policy, decisions aimed at promoting a sound and stable financial system, and the strategic direction of the Bank.

Box 1: The Policy Rule in ToTEM

The policy rule used in ToTEM is:

$$R_t = \rho R_{t-1} + (1-\rho)[R^* + \phi_\pi(E_t\pi_{t+k} - \pi^T) + \phi_y(y_t)],$$

where R_t is the overnight rate in quarter t, R^* is the long-run neutral overnight rate, $E_t\pi_{t+k}$ is the core inflation rate k quarters in the future as forecasted (expected) in quarter t, π^T is the target inflation rate, and y_t is the output gap (defined as Ln(real GDP ÷ potential GDP)*100) in quarter t. The coefficients ρ, ϕ_π and ϕ_y are constants. The values of the constants are $R^* = 4.75$ percent, $k = 2$ quarters, $\pi^T = 2$ percent, $\rho = 0.95$, $\phi_\pi = 20$, and $\phi_y = 0.35$. These are the same values as in the original 2006 version of the model, which suggests that they are durable and robust numbers.

Using the parameter values in the equation above and rearranging to emphasize the sources of a change in the interest rate gives the following rule for computing the Bank's forecast of the overnight rate:

$$R_t = R_{t-1} + 0.05(4.75 - R_{t-1}) + (E_t\pi_{t+2} - 2) + 0.0175y_t$$

The predicted change in the overnight rate has three components: (1) The neutral overnight rate minus the previous period's overnight rate, $(4.75 - R_{t-1})$, with a weight of 0.05; (2) The output gap, y_t, with the extremely small weight of 0.0175; and (3) The inflation rate expected two quarters in the future minus the inflation target, $(E_t\pi_{t+2} - 2)$, with a weight of one.

Source: Cateau and Murchison (2010).

The recent Cateau-Murchison paper provides the positive and welcome step of drawing attention to the rule currently used by the Bank's staff economists to provide forecasts for policymakers. In particular, the rule provides a useful framework for organizing our thoughts about where the overnight rate is headed and how quickly it will adjust. However, it turns out that trying to use the rule as currently implemented in ToTEM leaves crucial questions unanswered.

Our goals in this *e-brief* are: (1) To project the path for the overnight rate implied by the ToTEM policy rule when combined with the forecasts of the Bank's Governing Council (GC); (2) To expose an inconsistency between the GC forecasts and the staff projections; (3) To question the neutral overnight rate, which would keep the economy at its productive potential over time, used in the projection rule; and (4) To recommend steps that will achieve the transparency sought by market participants and the Bank.

Projecting the Overnight Rate

The Bank publishes the GC forecasts of the inflation rate and the growth rates of real GDP and potential GDP in its quarterly *Monetary Policy Report* (e.g., Bank of Canada, 2010). It also publishes its estimate of the most recent output gap (defined as Ln(real GDP ÷ potential GDP)x100). Using this information together with the policy-rule equation in Box 1, we can project the overnight rate that is consistent with the GC forecasts and the overnight rate rule used in ToTEM projections.[2]

Table 1 provides our data on the expected core inflation rate, the forecasted output gap, and the projected overnight rate. The overnight rate creeps up very slowly by 25 basis points on 1 June 2010, and by another 25 basis points on October 19. It keeps rising slowly through 2011 to 150 points and to 200 points by the third quarter of 2012. These forecasts are conditional on current information and will change as the expected future outlook changes.

According to ToTEM, the overnight rate is headed toward the neutral rate, 4.75 percent, but it will take a very, very long time to get there unless the expected future core inflation rate spikes above 2 percent. Hence, absent economic shocks, the overnight rate almost never reaches its long-run neutral value. This behaviour arises from the low weight, 0.05,

2 The formula uses the annualized quarter-on-quarter changes in the core price level but the Bank publishes year-on-year percentage change forecasts. We have inferred the quarter-on-quarter changes from the year-on-year changes by projecting backward. The results of this exercise are sensitive to rounding and greater accuracy could be achieved if the Bank published its quarter-on-quarter forecasts of core inflation.

Table 1: ToTEM Rule Forecasts

Quarter	Core Inflation Rate $E\pi_t$	Output Gap y_t	Overnight Rate R_t
	(%)	*(%)*	*(%)*
2010Q1	2.40	-2.30	0.25
2010Q2	2.00	-1.73	0.25
2010Q3	1.20	-1.23	0.50
2010Q4	1.60	-0.73	0.75
2011Q1	2.00	-0.29	0.75
2011Q2	2.00	-0.06	1.00
2011Q3	2.00	-0.06	1.25
2011Q4	2.00	-0.06	1.50
2012Q1	2.00	-0.06	1.50
2012Q2	2.00	-0.06	1.75
2012Q3	2.00	-0.06	2.00
2012Q4	2.00	-0.06	2.00

Source: Authors' calculations based on April 2010 *Monetary Policy Report*.

on the spread between the long-run neutral value and the current rate. Increasing that weight to one, the overnight rate jumps to 4.5 percent by the end of 2010 and gets to its long-run level in the second quarter of 2011.

Inconsistency Between the GC Forecast and ToTEM Projection

The forecasts of inflation and output growth in the *Monetary Policy Report* are those of Governing Council. Although informed by the ToTEM projection, they may deviate to reflect more recent higher frequency data than that in a formal quarterly model as well as the informal judgements of the staff economists and members of the GC. The implausibly slow response of the overnight rate in Table 1 to its neutral level might reflect a lower predicted path for inflation by the GC than the ToTEM forecast. It could also reflect a judgement that the market expects a much faster adjustment of the overnight rate to its neutral level in this episode than we've seen in response to earlier shocks. It could also reflect a belief that the neutral level will be different next year.[3]

In the absence of a careful determination of the implicit rule used since the onset of the 2008 crisis, it is instructive to look at the implications for the overnight rate of maintaining the basic ToTEM formula but lowering the inertia – lowering the value of the weight on the lagged overnight rate.

Changing the weight on the lagged overnight rate ρ in the ToTEM formula, and raising the weight on the current value of its long-run level requires changing the coefficient on the inflation rate. With a weight of 0.95 on the lagged overnight rate and 0.05 on its current long-run value, the weight on inflation is 20. The idea, presumably, is to satisfy the Taylor Principle.[4] The combination of 0.05 and 20 puts the weight on the current forecast of core inflation, two quarters in the future, at one.

In changing the weight on the lagged overnight rate, we have changed the coefficient on inflation to be the reciprocal of ρ to maintain the effect on the current long-run level at one. So we have used the formula:

$$R_t = R_{t-1} + (1-\rho)\,[R^* - R_{t-1} + \phi_y(y_t)] + (E_t\pi_{t+k} - \pi^T)$$

varying the value of ρ through a range of values shown in Table 2.

3 We discuss this point in the next section.

4 The principle that to avoid explosive paths for inflation the overnight rate must rise (fall) by more than the rise (fall) in the inflation rate.

Table 2: The Overnight Rate under Different Assumptions for the Interest-Rate Smoothing Parameter

Quarter	$\rho = 0.95$	$\rho = 0.75$	$\rho = 0.50$	$\rho = 0.25$
	(%)	*(%)*	*(%)*	*(%)*
2010Q1	0.25	0.25	0.25	0.25
2010Q2	0.25	0.25	0.25	0.25
2010Q3	0.50	1.25	2.25	3.25
2010Q4	0.75	2.00	3.50	4.25
2011Q1	0.75	2.75	4.00	4.50
2011Q2	1.00	3.25	4.25	4.75
2011Q3	1.25	3.50	4.50	4.75
2011Q4	1.50	4.00	4.75	4.75
2012Q1	1.50	4.00	4.75	4.75
2012Q2	1.75	4.25	4.75	4.75
2012Q3	2.00	4.25	4.75	4.75
2012Q4	2.00	4.50	4.75	4.75

Source: Authors' calculations based on April 2010 *Monetary Policy Report*.

A small decrease in ρ brings a large increase in the forecasted path of the overnight rate. Lowering ρ to 0.75 has the overnight rate at 2 percent by the end of 2010 and lowering it to 0.5 takes the rate to 3.5 percent by the end of 2010 (Table 2).

There is a deeper problem than the implausibly slow adjustment of the overnight rate in the ToTEM equation: An overnight rate that persistently remains below neutral is not consistent with an inflation path that approaches the target from below and then remains on target. For inflation to remain on target, the overnight rate must be in neutral. If the inflation rate is approaching target from below, it must be exerting a *downward* influence on the overnight rate. Empirically, the term $(1 - \rho)[R^* - R_{t-1} + \phi_y(y_t)]$, is pretty small, so the combination of inflation approaching target from below and a falling overnight rate is highly unlikely to occur unless the overnight rate starts out above neutral.

We verified this reasoning by calculating the path for the overnight rate by solving for its path backwards from neutral at the end of 2012. In the third quarter of 2010, the overnight rate jumps to slightly more than neutral and then quickly converges on neutral from above. Rounding to the nearest 25 basis points, the rate jumps exactly to neutral, where it remains until inflation gets pushed away from target.

Because the overnight rate in Table 1 does not behave in the manner just described, ToTEM's projected inflation path cannot be the one projected by the GC.

What is the Neutral Overnight Rate?

The neutral overnight rate of 4.75 percent, which implies a neutral real overnight rate of 2.75 percent, is the historical average over a long period that includes the high inflation years of the 1980s. Looking at the period since 2000, during which inflation and interest rates have fluctuated around what looks like a stationary path, the real overnight rate is 1.69 percent (or 1.75 percent to the nearest 25 basis points).

ToTEM has another real interest rate, the rate of time preference for household decisions – the rate at which households discount future consumption relative to current consumption. This rate should be consistent with the neutral real overnight rate and suggests another approach to calibrating it. Using this approach gets a neutral real interest rate of 2.0 percent per year.[5]

5 In Murchison and Rennison (2006), pp.57-58, the household discount rate is defined as $\beta = (1 + r)^{-1} g^{(1/\mu)}$ where r is the real interest rate (0.008 per quarter), g is the steady state real per capita GDP growth rate and is 1.005, and μ is the intertemporal elasticity of substitution and is 0.9. These parameters make $\beta = 0.9976$ and the rate of time preference 1.0 percent per year. For the economy as a whole (as distinct from a representative household) we need to add the "biological" interest rate component – the population growth rate, which is just over 1.0 percent, so the real rate for the economy is 2 percent per year.

These alternative calibrations suggest a neutral rate of between 3.75 and 4.00 percent. Jumping quickly to this range seems less implausible and a belief that the neutral rate has fallen to this range (or below) appears to be required to achieve the GC inflation projections.

Greater Transparency Needed

Clearly, the GC currently disagrees in a substantive way with the projection and endogenous monetary policy rule in ToTEM. But just as clearly it is, as Cateau and Murchison argue, "in the central bank's own best interest to respond to economic developments in a predictable fashion ... [to enable] ... markets to better forecast the central bank's future actions." The Bank must do more to achieve this goal. We encourage the Bank to publish its own conditional forecast of the future path of the overnight rate. If that is going too far, we suggest the Bank consider publishing its conditional forecasts with a six-month lag to enable market participants to learn what these forecasts mean and how to use them.

If even this step is too big, we believe the Bank should provide enough information to enable market participants to infer how it will respond to changing economic developments and remove the ambiguities to which we have drawn attention.

References

Bank of Canada, 2010. *Monetary Policy Report*. Ottawa: Bank of Canada, April.

Cateau, Gino, and Stephen Murchison. 2010. "Monetary Policy Rules in an Uncertain Environment." *Bank of Canada Review Spring 2010,* 27 - 39.

Murchison, Stephen, and Andrew Rennison. 2006. "ToTEM: The Bank of Canada's New Quarterly Projection Model." Bank of Canada Technical Report No. 97, December.

This *e-brief* is a publication of the C.D. Howe Institute.

Angelo Melino is Professor of Econnomics at the University of Toronto and a member of the Monetary Policy Council of the C.D. Howe Institute.

Michael Parkin is Professor of Economics at the University of Western Ontario and a member of the Monetary Policy Council of the C.D. Howe Institute.

For more information call 416-865-1904.

This *e-brief* is available at www.cdhowe.org.